COSMETIC CO-REMOVAL OF MATERIAL FOR ELECTRONIC DEVICE SURFACES

CROSS-REFERENCE TO RELATED APPLICATION(S)

[0001] This application is a continuation patent application of U.S. patent application Ser. No. 15/134,621, filed Apr. 21, 2016 and titled "Cosmetic Co-Removal of Material for Electronic Device Surfaces," which is a continuation patent application of U.S. patent application Ser. No. 12/794,496, filed Jun. 4, 2010 and titled "Cosmetic Co-Removal of Material for Electronic Device Surfaces," now U.S. Pat. No. 9,363,905, which claims the benefit of U.S. Provisional Patent Application No. 61/300,780, filed Feb. 2, 2010 and titled "Handheld Device Enclosure," U.S. Provisional Patent Application No. 61/325,625, filed Apr. 19, 2010 and titled Electrically Insulating Connection Between Conductive Components," and U.S. Provisional Patent Application No. 61/325,786, filed Apr. 19, 2010 and titled "Cosmetic Co-Grinding of Electronic Device Surfaces," the disclosures of which are hereby incorporated by reference herein in their entireties.

BACKGROUND

[0002] A portable electronic device can be constructed using different approaches. In some cases, an electronic device can be constructed by assembling several components together. The components can include external components combining to form a device enclosure, as well as internal components providing different functionality to the device. For example, an electronic device enclosure can include an integral component, or a component constructed from a single material (e.g., a housing member). Such a component can provide substantial structural integrity, as there may be no seams or gaps limiting the resistance of the component to applied external forces.

[0003] In some cases, a component of an electronic device can be used as part of an electrical circuit. For example, a component can provide electrical functionality to another component of a device (e.g., serve as a resistor or as a capacitor for a processor). As another example, a component can be part of an antenna assembly of an electronic device. If the component is used in only a single electrical circuit, the component can be constructed from a single piece of conductive material. If the same component, however, is used in several different electrical circuits, the component may need to be constructed from several conductive elements separated by a non-conductive or insulating element. For example, first and second conductive elements can be connected together by an insulating intermediate element.

[0004] The insulating element can be connected to conductive elements of a component using any suitable approach. In some embodiments, the insulating element can extend beyond an interface between the insulating element and a conductive element as a result of the manufacturing process used to connect the conductive elements together using the insulating element. For example, a molded insulating element can include excess material that seeped through a seam of a mold. When the multi-element component is part of the electronic device enclosure, the excess material can adversely affect a user's enjoyment of the device. For example, the excess material can catch on a user's hand or clothing. As another example, the excess material can increase a user's odds of dropping and breaking the electronic device. As still another example, the excess material can adversely affect the aesthetic appearance of the device.

SUMMARY

[0005] This is directed to simultaneously processing several different materials forming a single surface of an electronic device component to define a continuous component surface extending over an interface or seam between the different materials. In particular, this is directed to providing a component constructed by combining several elements, and removing material from at least two of the several elements to provide a continuous and cosmetically pleasing surface across interfaces between the elements. The several elements can be formed from at least two different materials having different material properties.

[0006] An electronic device component can be constructed by connecting two elements together using an intermediate element formed from a material other than that used for at least one of the two elements. For example, the two elements can be constructed from a conductive material (e.g., metal), while the intermediate element can be constructed from an insulating material (e.g., plastic). The materials used can have different properties including, for example, different mechanical, manufacturing, electrical, and thermal properties (e.g., materials having different manufacturing or mechanical hardness). The different properties of the materials can require different processes for cutting or removing portions of the materials including, for example, different tools, different settings for a single tool, or different manufacturing processes (e.g., different machines).

[0007] To create an aesthetically pleasing component, and in particular to remove excess material from one or more of the elements to provide a continuous surface across an interface between adjacent elements of the component, one or more finishing processes can be applied to the connected elements. In some cases, a single tool or process can be used to finish a surface that includes several elements constructed from different materials. For example, a single tool can be used for an entire component. As another example, a tool can be used for each of several different surfaces of a component (e.g., surfaces on different planes). Because of the different material properties of the elements, however, the manner in which the process or tool is applied (e.g., rotation speed, or application force) can vary based on the element being processed. In some cases, the process can dynamically adjust settings based on the particular element being processed. In other cases, the process can apply settings that correspond to a softer of several materials.

[0008] Any suitable type of finishing process can be applied to a component. For example, a process can remove excess material, smooth out bumps, fill valleys or holes, or perform any other operation required to provide a continuous and uniform surface across an interfaces between elements connected together in the component. Such a process can include, for example, a polishing or grinding operation. By processing the component post-assembly (e.g., once individual elements have been connected together), the resulting component may have continuous external surfaces and even appear to be formed from a unitary piece of material, despite being the combination of several elements.